Distribution and Movements of Birds in the Bering and Chukchi Seas

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THIS PAPER reports on pelagic observations of about 29 species of birds in the northern Bering Sea and the Chukchi Sea during a cruise in the late summer of 1960. This work represents part of a larger study of the sea bird colonies at Cape Thompson, Alaska (Swartz, 1966).

The problems presented by the offshore distribution and movements of sea birds have proved refractory to many workers. Primarily, efforts to delineate and solve these problems have been incidental to other objectives of sea voyages and have centered in the North Atlantic and Barents Sea. Wynne-Edwards (1935) has brought together much of this scattered work from the North Atlantic, and Belopolski (1957) summarized data from the Barents Sea. Recently, Kuroda (1960) and Shuntov (1961) have published observations extending into the Bering Sea. Jacques (1930) is the only worker to publish substantial pelagic observations north of Bering Strait.

THE ENVIRONMENT

An intensive investigation of the Chukchi Sea (Fig. 1) began in 1959 when the Department of Oceanography of the University of Washington, under the direction of Dr. R. H. Fleming, and the Bureau of Commercial Fisheries sent their respective research vessels, the "Brown Bear" and the "John Cobb," to the area. These organizations together undertook extensive physical, chemical, and biological investigations. In 1960, the Department of Oceanography sent the "Brown Bear" to these waters again in order to extend and verify the results of the 1959 cruise.

Two publications (Wolfe, 1960, 1962) include brief summaries of the scope of the marine programs but present little actual data.

The results of these projects have been presented in preliminary form in several reports prepared for the individual financing agencies. Formal publication has been made of some of the University of Washington work (Creager and McManus, 1961; Fleming et al., 1961; Fleming and Heggarty, 1962), and a large volume has recently been published including the work of many individuals which provides comprehensive coverage of almost all aspects of the marine environment included within the scope of this paper (see Swartz, 1966).

The following brief summary of the characteristics of this environment is summarized from personal experience, the preliminary reports mentioned, the published works, and from personal communication and conversation with the individuals involved in the marine programs.

The Chukchi Sea, in which most of the

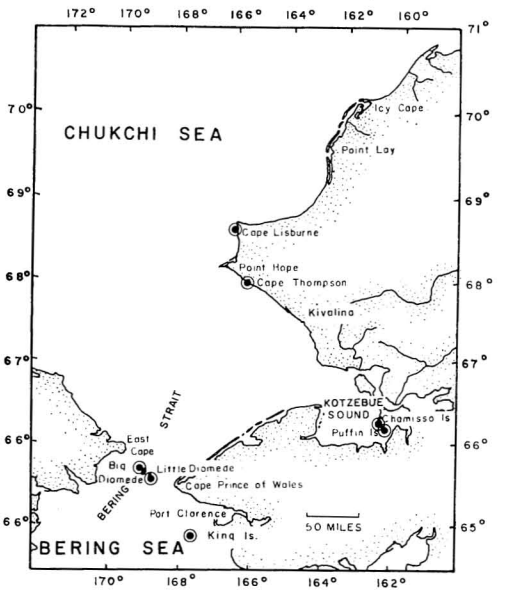

FIG. 1. The Bering and Chukchi seas showing the area included within this study. Major sea bird colonies near the cruise track are indicated with the circular symbol.

[1] Biological Sciences Department, University of Alaska, College, Alaska. This work was done under Contract No. AT-(04-3)-310 with the United States Atomic Energy Commission. Manuscript received June 29, 1966.

pelagic bird observations were made, is shallow with a relatively featureless bottom (Fig. 2). In the area sampled, few depths exceed 35 fathoms. Current and temperature patterns are complex. In general, current flow is northward through Bering Strait (Fig. 4). Patterns of current flow in the northern Chukchi Sea seem to be affected strongly by winds. Temperature patterns at 5-m depths are shown in Figure 5. The invertebrate fauna is rich and abundant, but fishes are not conspicuously abundant in either species or individuals, though of course their numbers are adequate to support sea bird colonies in apparent prosperity (Swartz, 1966).

ACKNOWLEDGMENTS

Dr. R. H. Fleming, of the University of Washington, offered to place a man aboard the University of Washington research vessel, "Brown Bear," to observe sea birds during a portion of its 1960 oceanographic cruise (Brown Bear Cruise 268). Mr. E. J. Willoughby was selected to be the observer and deserves great credit for the zeal and accuracy of his work. The cooperation of Dr. Fleming, the crew, and the research staff of the "Brown Bear" is gratefully acknowledged.

Willoughby's activities were financed to a major degree by a program directed by F. S. L. Williamson of the Arctic Health Research Center. I am greatly indebted to Mr. Williamson for permission to include in this paper the observations on species not breeding at Cape Thompson. These species were initially in his province and this paper could not have had its present form without his generous cooperation.

PROCEDURE

The portion of the cruise track of the "Brown Bear" which is included in this paper is shown in Figure 3. Willoughby boarded the "Brown Bear" on August 6 near Cape Thompson and disembarked at Nome on August 28.

Most observations were made from the flying bridge where the view in all directions was relatively unobstructed. In order to achieve an objective index of abundance and movements, 10-minute-long counts of all birds seen and records of their activities were made at intervals throughout the 24-hour period. Detailed observations were continued between the 10-minute counts to the extent permitted by weather, visibility, and the endurance of the observer. Over 600 entries pertaining to sea birds were made in addition to 10-minute counts. Latitude and longitude are known for each entry. Observations including time, position, surface temperature of the sea, wind speed and direction, wet and dry bulb air temperature, barometer readings, precipitation, size and direction of swell, and approximate visibility were recorded several times a day from routine readings made by Willoughby and other ship personnel. All of these data were examined and those which proved meaningful in interpreting the avian observations are discussed at the appropriate place. Since conditions of visibility varied widely from day to day, no effort was made to convert the data to absolute abundance per square unit of sea surface as was done by Kuroda (1960).

During the same interval that Willoughby was making observations at sea, a shore party was conducting investigations of the large colonies at Cape Thompson. It was hoped that comparisons of behavior at the breeding cliffs with offshore observations would yield significant information not otherwise obtainable. With the exception of the expected observation that departure of flocks from the cliffs produced a rise in numbers observed at sea, this hope was not realized.

RESULTS

Below, listed phylogenetically, are discussions of distribution, abundance, and movements of birds seen from the "Brown Bear." Unless specifically noted, all species were previously observed in the Bering or Chukchi seas by Jacques (1930) or Shuntov (1961), the only authors who have published substantial offshore observations which overlap those reported here.

Loons (Gavia sp.)

Two sightings of unidentified loons were made, both close to shore (Fig. 6). Four of these birds were seen at 69°46′N, 163°17′W

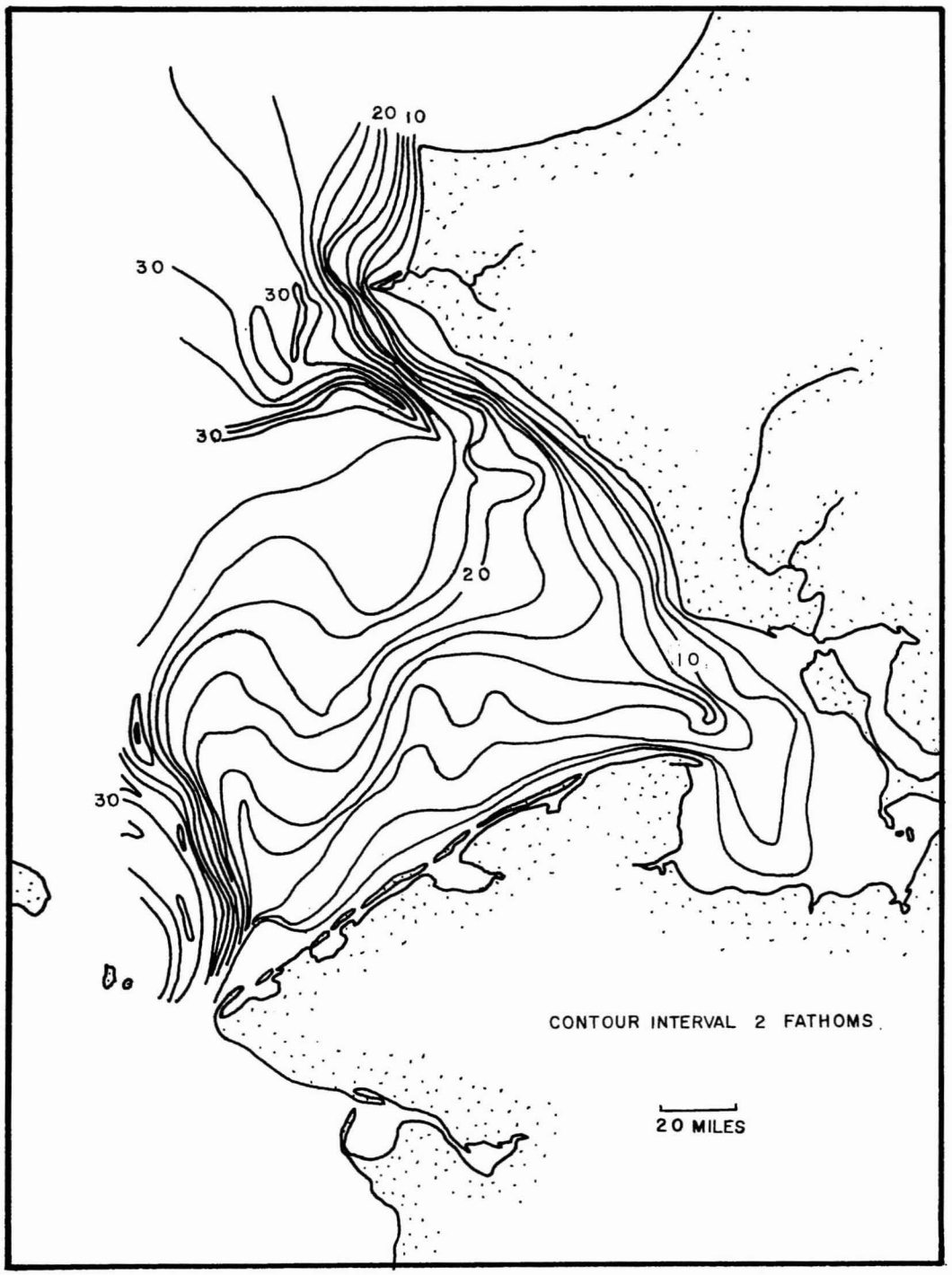

FIG. 2. The Bering and Chukchi sea showing bottom contours. (Modified from Creager and McManus, 1961.)

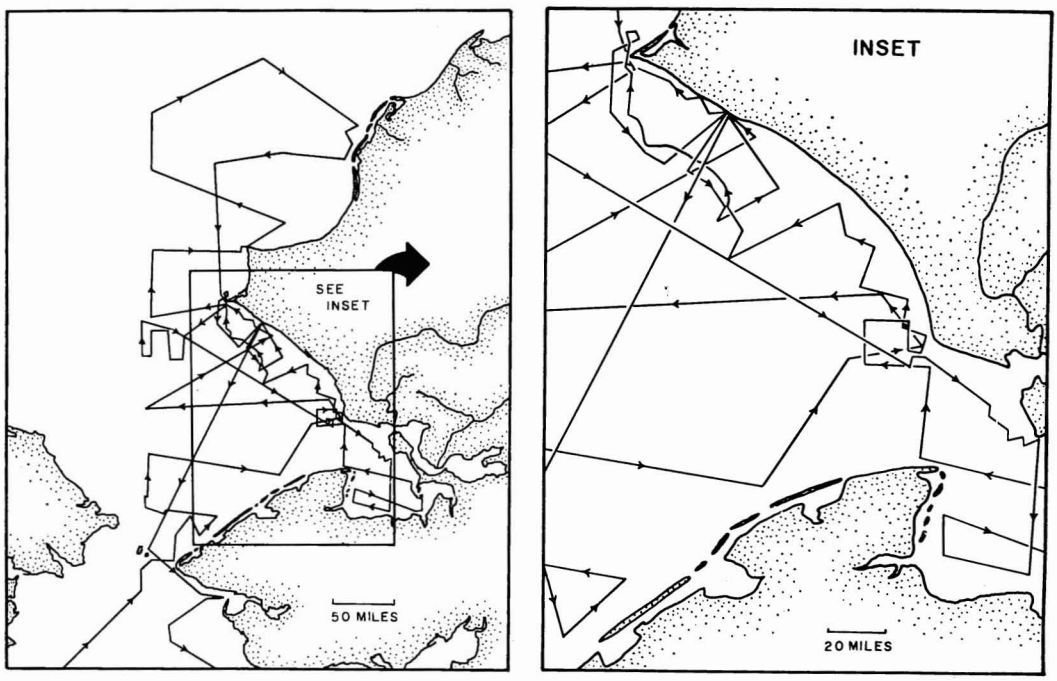

FIG. 3. The Bering and Chukchi seas, showing the portion of the cruise track of the "Brown Bear" included within this study. (Modified from Fleming et al., 1960.)

between Point Lay and Icy Cape; another was seen near Chamisso Island in Kotzebue Sound.

Fulmar (Fulmarus glacialis)

Fulmars were seen on 11 occasions (Fig. 6), ordinarily as single birds. Two birds were seen together near Bering Strait and three or four near Little Diomede Island amid a large number of alcids. Feeding concentrations as seen by Kuroda (1960:59) were not observed but, on the other hand, Fulmars were not abundant during any part of this voyage. Shuntov (1961: 1063) described Fulmars as the most abundant bird in the Bering Sea west of the Pribilofs. Jacques (1930:360–361) remarked on their abundance near the Pribilofs and off East Cape but, in common with observations from the "Brown Bear," he saw them only occasionally in the Chukchi Sea. All the Fulmars observed (14 or 15) were the light phase, which agrees with the observations of Jacques (1930:361) that in the Arctic the light phase greatly predominates.

Shearwaters

Probably all shearwaters seen (Fig. 7) were Slender-billed Shearwaters (*Puffinus tenuirostris*), but they could not always be identified with certainty. It is possible that some were Sooty Shearwaters, though no records are known from north of the Aleutian Islands (Gabrielson and Lincoln, 1959:80–81). The former species, which breeds in the southern hemisphere, spends its nonbreeding season in northern waters and has been collected and observed as far north as Point Barrow (Gabrielson and Lincoln, 1959:78). Several of the sightings reported here were feeding flocks, on one occasion near Cape Thompson comprising between 500 and 1,000 individuals. In no case, however, did abundance approach the concentrations that have been observed by other authors south of Bering Strait (see Gabrielson and Lincoln, 1959:79; Shuntov, 1961:1061–1062).

Cormorants (Phalacrocorax)

Cormorants were identified on four occasions (Fig. 7), chiefly within sight of nesting cliffs. One doubtful sighting was made near Chamisso Island in Kotzebue Sound. Cormorants were presumably all Pelagic Cormorants (*P. pelagicus*), but doubt exists in some cases. An observation about 20 miles from Little Diomede

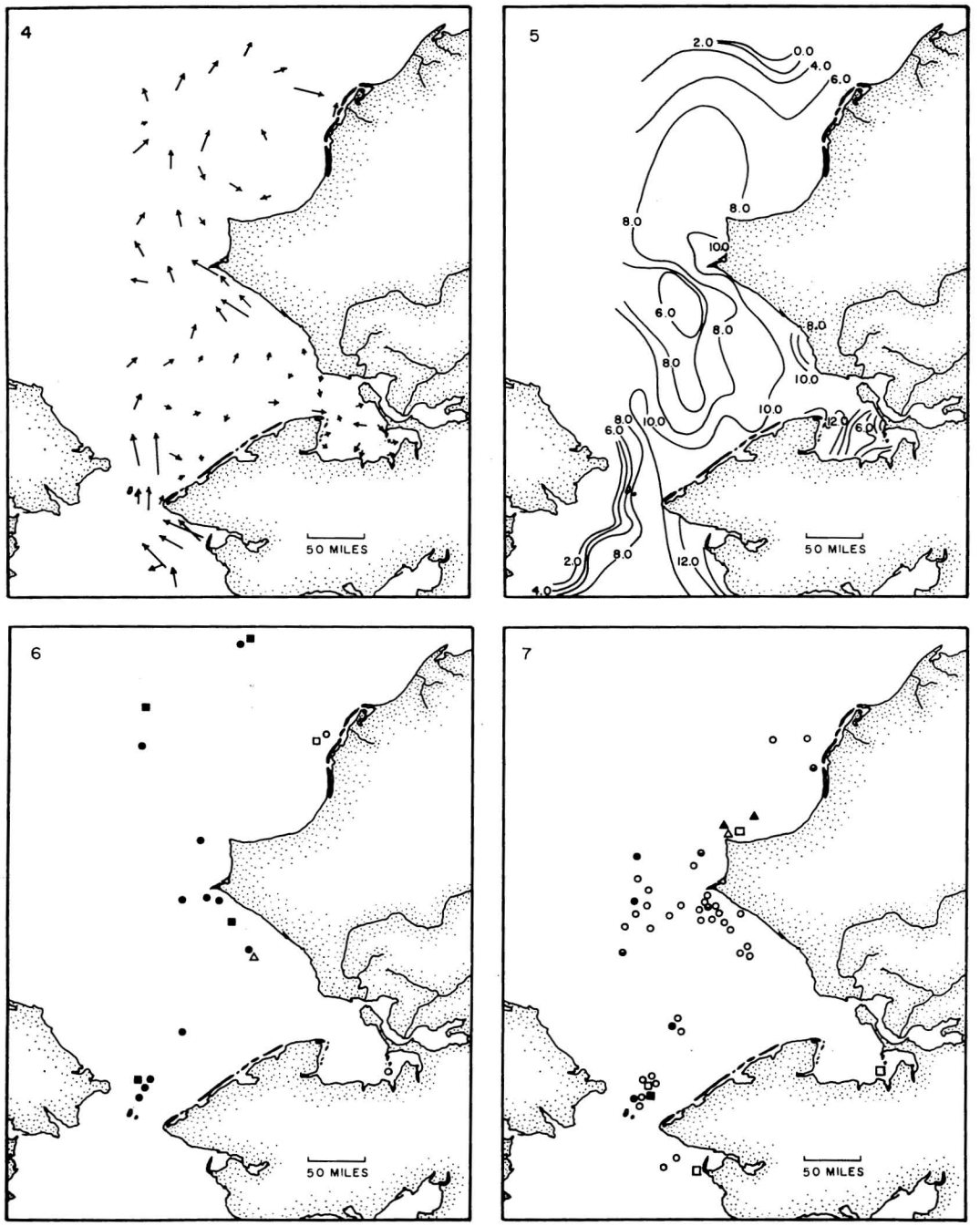

FIG. 4. Surface currents (5.0 m). Vector length indicates speed of current. (From Fleming and Heggarty, 1960.)

FIG. 5. Surface (5.0 m) isotherms. (From Fleming et al., 1960.)

FIG. 6. Observations of loons, ○; the Fulmar, ●; Pectoral Sandpiper, □; unidentified sandpipers, ■; and the Long-billed Dowitcher, △.

FIG. 7. Observations of the Slender-billed Shearwater, ○; unidentified shearwaters, ●; cormorants, □; the Old Squaw, ■; Common Eider, △; Spectacled Eider, ▲; and unidentified eiders, ◒.

Island represents the maximum distance these birds were seen from shore or nesting colonies. Jacques (1930:362) apparently did not observe cormorants north of Bering Strait, but his voyage did not bring him close to breeding colonies so this is not surprising.

Old Squaw (Clangula hyemalis)

Numerous Old Squaws were seen very close to shore between Cape Thompson and Point Hope by the shore party, but only a single pelagic observation (near Bering Strait) was made (Fig. 7). This pattern of distribution is probably typical of this species during the breeding season.

Common Eider (Somateria mollissima)

One sighting was made of 19 Common Eiders close to the shore of Cape Lisburne (Fig. 7).

Spectacled Eider (Lampronetta fischeri)

Two sightings were made, one single individual and one flock of four, both near the Cape Lisburne cliffs (Fig. 7).

Unidentified Eiders

Four sightings of small flocks of unidentified eiders were made, only one more than a few miles offshore (Fig. 7).

Pectoral Sandpiper (Erolia melanotos)

This species was identified only at one location, off Point Lay (Fig. 6), when a single bird landed on the deck of the "Brown Bear" and walked about for 5 minutes. A Pectoral Sandpiper was seen flying 15 minutes later and may have been the same bird. Jacques (1930:353–366) did not observe this species. Shuntov (1961:1066) observed sandpipers in the Bering Sea, but did not identify the species.

Unidentified Sandpipers

Sandpipers which could not definitely be identified were seen on four occasions (Fig. 6), two of which were more than 100 miles from shore.

Long-billed Dowitcher
(Limnodromus scolopaceus) (?)

A single individual, probably of this species, was observed about 30 miles off the coast near Kivalina (Fig. 6).

Red Phalarope (Phalaropus fulicarius)

All identified phalaropes were of this species, but it is possible that some Northern Phalaropes (*Lobipes lobatus*) were present in the area. Jacques (1930:364) commented to similar effect that probably all the phalaropes he saw in the Arctic Ocean were Red Phalaropes. Red Phalaropes were seen at 28 locations, mostly in groups of 3–6, although 13 solitary individuals were seen. Observations were widely scattered over the course of the cruise, but none were made south of Bering Strait (Fig. 8).

Unidentified Phalaropes

In many cases, it was not possible definitely to identify phalaropes. No doubt most, if not all, of the unidentified birds were Red Phalaropes (Fig. 8).

Pomarine Jaeger (Stercorarius pomarinus)

Seven scattered sightings of this species were made, all north of 67°N (Fig. 9). Four of these were single birds, two sightings were of two birds, and one of "several." Jacques (1930:357) found it to be common or abundant north of Bering Strait during about the same time of year. Shuntov (1961:1065) observed a northerly movement of Pomarine, Parasitic, and Long-tailed Jaegers in the southern Bering Sea in the end of May and beginning of June, which probably represented migration to breeding grounds. He saw Pomarine Jaegers commonly, but only infrequently observed the other species.

Parasitic Jaeger (S. parasiticus)

This species was seen on 12 occasions (Fig. 9). As was the case with the previous species, all sightings were made north of 67°N. Eight sightings were of single individuals, one of three, two of two, and one of "several."

Long-tailed Jaeger (S. longicaudus)

This species, though far more abundant as a breeding bird at least in the Cape Thompson area than the two preceding species, was almost entirely absent in the pelagic observations. Only two birds were seen (Fig. 9).

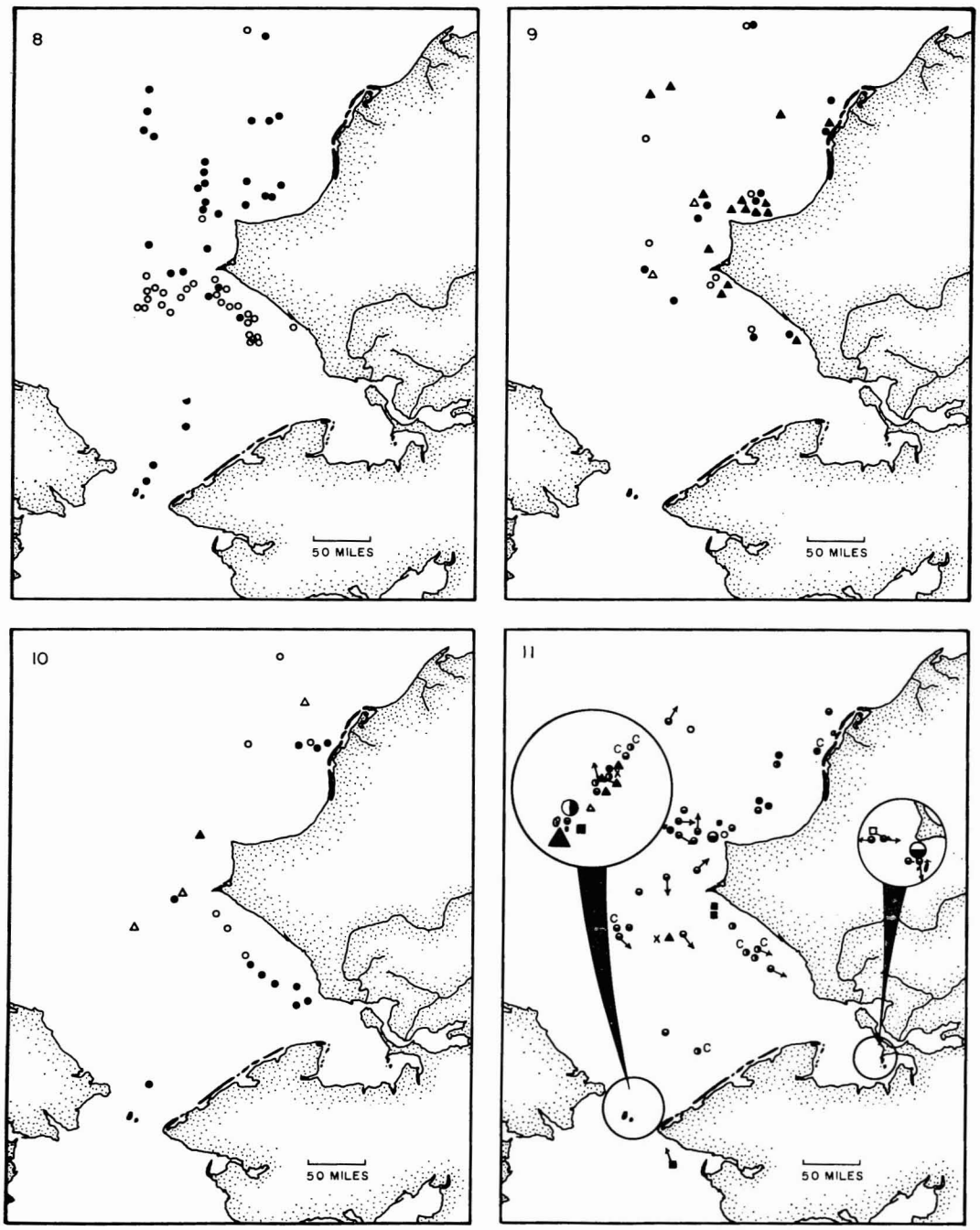

FIG. 8. Observations of the Red Phalarope, ○; and unidentified phalaropes, ●.

FIG. 9. Observations of the Pomarine Jaeger, ○; Parasitic Jaeger, ●; Long-tailed Jaeger, △; and unidentified jaegers, ▲.

FIG. 10. Observations of the Sabine's Gull, ○; Arctic Tern, ●; Yellow Wagtail, △; and the Water Pipit, ▲.

FIG. 11. Abundance, distribution, and movements of the Pigeon Guillemot, ○; Kittlitz's Murrelet, ●; Parakeet Auklet, □; Crested Auklet, ■; Least Auklet, △; unidentified auklet, ▲; Horned Puffin, ◒; and Tufted Puffin, ◑. Numbers and direction of flight in both species of puffins is indicated by size of symbol and direction of vector: o, 1–5; ○, "some"; ◯, hundreds. *C* indicates the birds were circling.

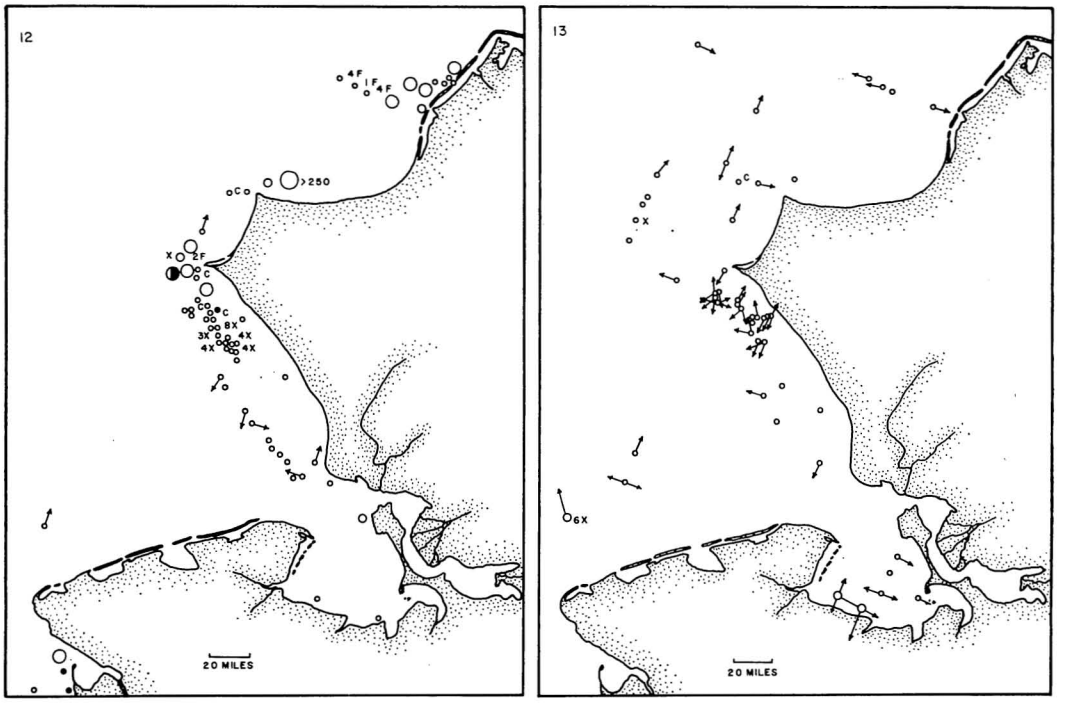

FIG. 12. Abundance, distribution, and movements of Glaucous Gulls (*open* and *half open circles*) and Herring Gulls (*black circles*). Numbers and direction of flight of Glaucous Gulls indicated by size of symbols and direction of vectors; smallest circle, 1–5; ○, 6–10; ◯, 11–20; ◑, 21–40; ◯, more than 150. *C* indicates circling, *F* indicates following the ship, and *X* indicates birds on the water.

FIG. 13. Abundance, distribution, and movements of Black-legged Kittiwakes. Numbers and direction of flight are indicated by size of symbols and length and direction of vectors: smaller circle, 1–5; ○, 11–20; shortest arrow, 1–5; → 6–10; ⟶ 11–20; *C* indicates circling and *X* indicates birds on the water.

Unidentified Jaeger

Jaegers were seen but could not be identified on 15 occasions. These observations were widely scattered but all were north of 67°N (Fig. 9).

Glaucous Gull (Larus hyperboreus)

Adult and immature Glaucous Gulls were most abundant at the cliffs and beaches where they fed extensively on the eggs and chicks of other species, especially murres. They were seen frequently to about 25 miles offshore and only occasionally at greater distances (Figs. 12 and 14). This species and, to a lesser extent, kittiwakes often followed the ship for up to several hours at a time. Both species fed on garbage thrown overboard. Although some tendency to fly into the wind was observed from shore and from the ship, no large movements of Glaucous Gulls in response to wind were evident. Such movements by larids have been observed by other authors, however (e.g., Harrison, 1955:109–110).

Herring Gull (Larus argentatus)

Two doubtful sightings of immature birds (possibly the same bird sighted at different hours) were made 16–18 miles west northwest of Cape Thompson on August 24. Groups of two, four, and three individuals were sighted near shore in the vicinity of Port Clarence (Fig. 12). All Herring Gulls sighted were immature.

Black-legged Kittiwake (Rissa tridactyla)

Both adult and immature kittiwakes were common on the open ocean (Fig. 13). Adults were often in winter plumage. The adults in breeding plumage and immatures were most abundant near the nesting cliffs, but the radius of their daily movements from the cliffs is not

clearly demonstrated (Fig. 15). It seems likely that breeding kittiwakes do not regularly fly out to sea as far as murres, but rather feed closer to shore. Regular patterns of movements which may exist are not evident from the data. Kittiwakes do not exhibit as distinct a pattern of daily activity fluctuations as do murres (Swartz, 1966), and do not characteristically fly as straight a course, so that possible flight trends might tend to be obscured. No movement, abundance, or distributional phenomena associated with daily rhythms are evident.

One kittiwake in winter plumage was collected at about 70°50′N, 165°30′W near the edge of the polar ice pack. The reproductive tract was undeveloped and brood patches were not present. It is likely that many of the adult kittiwakes seen on the open ocean far from shore are nonbreeders.

Sabine's Gull (Xema sabini)

These birds were seen on six occasions and all but one were immatures (Fig. 10). The only adults (six birds) were seen at 70°46′N, 165°42′W, near the northernmost point on the cruise track. No particular distributional pattern is evident.

Arctic Tern (Sterna paradisaea)

Arctic Terns were seen on 11 occasions in groups of from 1 to 17 birds, of which 7 were immature and the rest (43) were adults. Most of the sightings were within about 50 miles of a shoreline and all but 1 were within 40 miles of land (Fig. 10).

Murres (Uria lomvia and U. aalge)

Thick-billed and Common Murres are very similar in appearance and could not be differentiated consistently under the conditions prevailing at sea. They are therefore considered together and such differences as exist between them are discussed at the appropriate places.

The abundance and distribution of murres is plotted in Figures 16, 17, and 18. Due to the large total number of observations, only ten-minute count data are presented. Murres were the most abundant birds on the Chukchi Sea and were almost always visible from the ship even far from shore. Murres were seen in all but 24 (16%) of the 146 ten-minute counts. Of these 24 negative counts 19 were made in an area near and within Kotzebue Sound in which very few birds of any kind were seen.

Clear correlations between murre distribution and water temperature were found in this study. A striking decrease in the number of murres was noted on August 14 as the ship passed from colder waters to the warmer waters near Kotzebue Sound, crossing the 9°, 10°, 11°, and 12°C isotherms as plotted by Fleming et al. (1960: Fig. 5). (These isotherms represent the temperature 5 meters below the surface.) R. H. Fleming (personal communication) has observed this correlation on previous cruises in the area. Storer (1952:185) showed that the main breeding range of the Thick-billed Murre lies in areas where the August surface water temperatures are below 10°C and that the temperature tolerance of the Common Murre tends to be somewhat higher. Storer (1952:187) cited Salomonsen's (1944) claim that low temperatures retard spring molt and breeding in murres. This is clearly a local or individual response and would reinforce the contention that water temperatures could in part account for local distribution patterns.

As the ship passed deeper into Kotzebue Sound on August 14 a subsequent sharp drop in water temperature occurred, but no increase in murres was evident except near Chamisso and Puffin islands, where small numbers of Common Murres were seen. Grinnell (1900:7) reported "immense numbers" of Thick-billed Murres breeding on these islands but did not report Common Murres. Neither species seems any longer to be an abundant breeder.

The situation with regard to distribution and temperature is complex and at present remains unclear. Possibly not only water temperature but salinity, food supply, depth, and distance from breeding concentrations are interrelated factors. The speculation that a progressive northern range extension of the Common Murre is occurring which is correlated with long-term warming trends is provocative. Far too few data are available at present, however, to consider the hypothesis in detail.

In colder waters, murres were seen on all but 3% of the 10-minute counts. Even in these cases, murres were observed between the count-

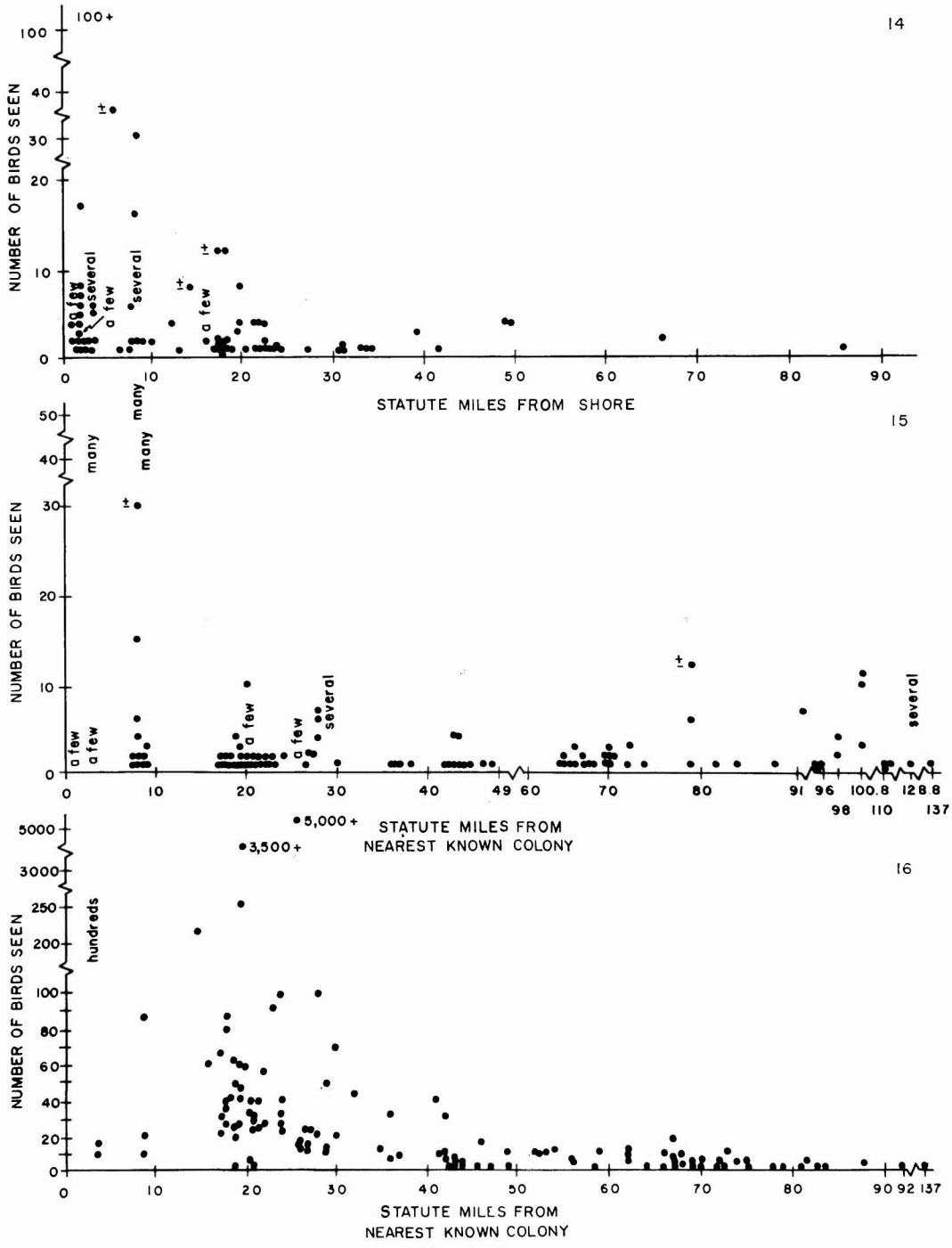

FIG. 14. Abundance of Glaucous Gulls vs. distance from the nearest shore. Since Glaucous Gulls may nest at many points along the shore, comparison is made between abundance and distance from the nearest land. All entries are included.

FIG. 15. Abundance of Black-legged Kittiwakes vs. distance from the nearest known colony. Because of incomplete knowledge of nesting colonies, observations from 10-minute counts near and in Kotzebue Sound are not included. All other observations are plotted.

FIG. 16. Abundance of murres vs. distance from the nearest known colony. Due to the great amount of data available, only 10-minute counts are plotted. Because of incomplete knowledge of nesting colonies, data from 10-minute counts in and near Kotzebue Sound are omitted.

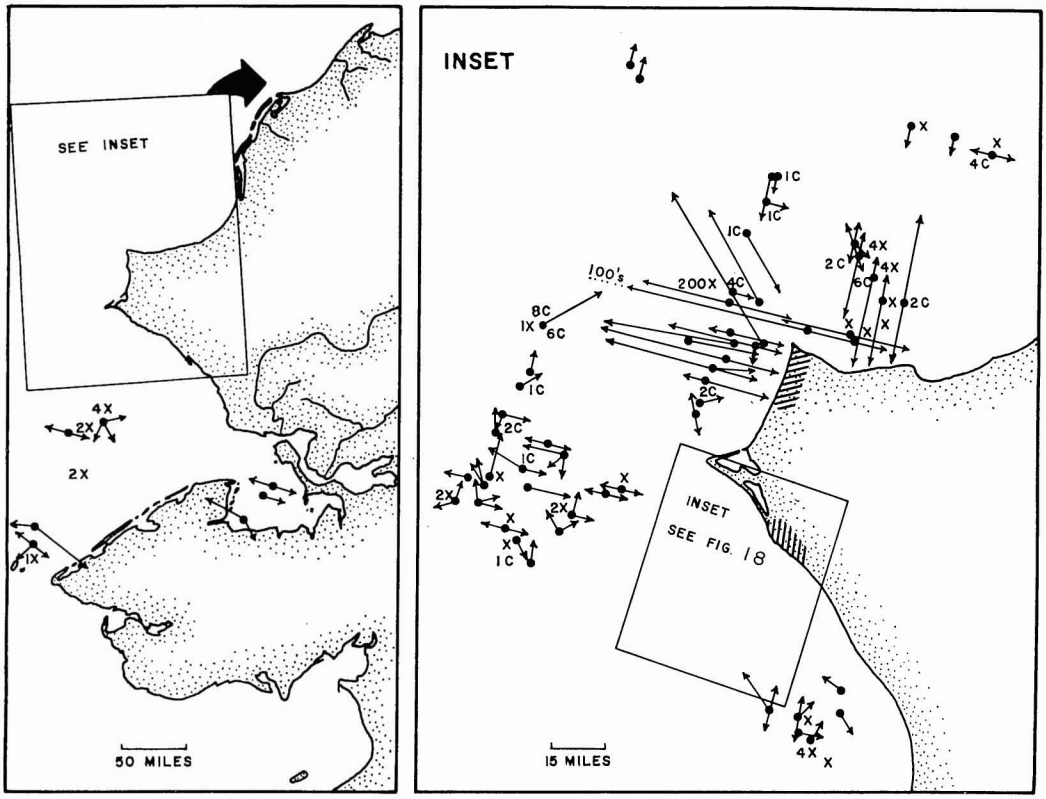

FIG. 17. Abundance, distribution, and movements of murres (10-minute counts only). Abundance is indicated by length of vector and, when not in flight, by numbers at the point of observation. The number is printed on the vector when more than 100. *C* indicates circling; *X* indicates that the birds were on the water. Cape Lisburne (*top*) and Cape Thompson colonies are indicated by *cross hatching*.

1–5 →
6–10 ⟶
11–20 ⟶
21–30 ⟶
31–50 ⟶
51–80 ⟶
81–100 ⟶

ing intervals. Although distinguishing the two species was difficult unless the birds came very close to the ship, it appears that away from the colonies at Cape Thompson and Cape Lisburne (in general, 5 miles offshore and beyond), Thick-billed Murres greatly outnumber the Common Murres, probably making up more than 90% of the murre population on the open ocean. On the nesting cliffs, the population is believed to include 60% Thick-billed Murres (Swartz, 1966), implying that Common Murres prefer shallower water than do thick-bills. This is consistent with data on food habits (Swartz, 1966), which imply that Common Murres feed in shallower water. The area on the open ocean in which the fewest murres were seen was near the ice pack at about 70°50′N, 166°00′W.

The greatest number of murres was found within about 40 statute miles from the nearest colony (Fig. 16). It is apparent from Figures 16, 17, and 18 and from direct observation of feeding activities made from the ship that the usual feeding activity of breeding birds takes place within about 40 miles of the nesting cliffs and mostly within about 30 miles. Since murres are strong flyers and are capable of flying at least 50 mph (Vaughan, 1937:123; Baxter and Rintoul, 1953; Portaz, 1928; Frowhawk, 1928, in: Tuck, 1960:23), a feeding distance of 30–40 miles seems reasonable. Feeding areas for the Cape Thompson colonies seem to be primarily south of Point Hope, and those for the Cape Lisburne colonies north and west of the Cape Lisburne cliffs, although some over-

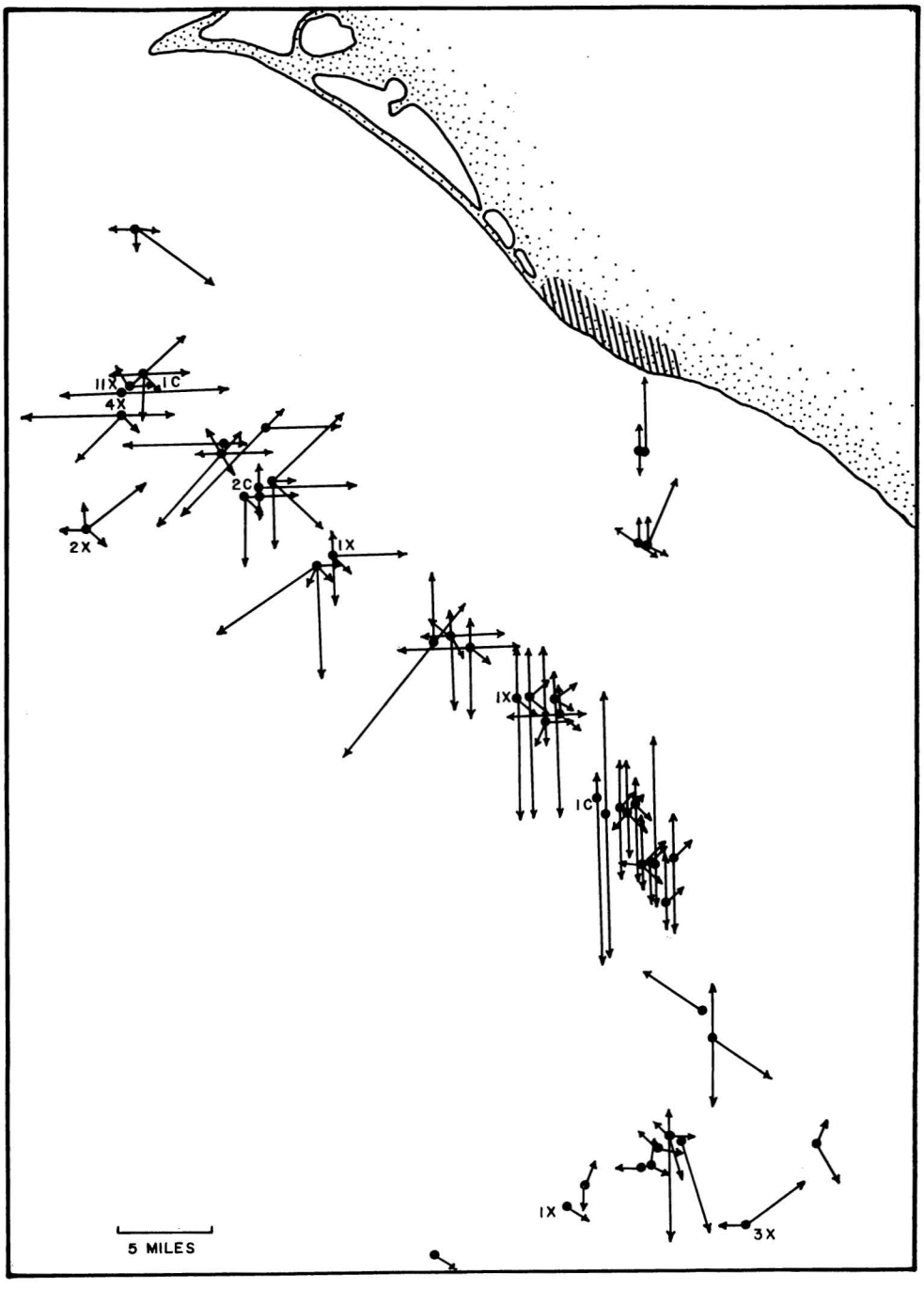

FIG. 18. Inset from Figure 17. Symbols as in Figure 17. *Cross hatching* indicates the location of the Cape Thompson breeding cliffs.

lap of feeding areas may sometimes occur near Point Hope. No particular portion of the ocean off the cliffs seems to be favored for feeding. Comparison of distribution with bottom types (Sparks and Pereyra, 1960:7*a*) does not reveal clear correlations.

Movements of murres in the open sea within about 40 miles of the nearest colony are strongly oriented by the location of the nesting colony and are little influenced by winds. Regardless of wind direction, murre flight is overwhelmingly oriented either toward or away from nesting areas (Figs. 17 and 18). Beyond the limit of daily feeding flights (about 40 miles), no significant flight trends are evident, in response either to weather or to colony location.

Local or short-term orientations to winds may be striking. Takeoffs from both water and cliffs are made into the wind whenever possible. In the immediate area of the nesting cliffs, flight patterns of murres approaching the cliffs are perceptibly influenced by winds. Several authors whose observations were made mostly from shore have noted flights of murres influenced by wind. Alexander (1935:299) observed feeding flights of Thick-billed Murres near Dungeness Point in England which usually proceeded against the wind. The same author reiterates that movements are related to winds but are more related to tides and currents. Fay and Cade (1959:123) suggest that movements of murres at St. Lawrence Island are correlated with tidal currents. Alexander (1935:299) stated that birds are carried by water currents away from the feeding waters and fly back to regain their initial position. In the Cape Thompson area, however, neither tides nor currents are strong and probably have little influence on murre movements. It is possible in the Cape Thompson area that winds may play the same displacing role that water movements may play elsewhere. Strong winds are common in the area, and Harrison (1955: 110) and several others have noted unusual flights of alcids following strong winds.

At Cape Thompson, flocks of murres coming in often approach the coastline 1 or 2 miles downwind from their nesting location and fly against the wind relatively close to shore. Under foggy conditions, which are especially common when the sea ice is still present, the murres appear to use the shoreline as a guide and fly only a few feet above the beach. While flying against the wind, murres, like many other species fly lower where friction with the substrate slows the air movements. Willoughby at sea and members of the shore party all repeatedly observed this tendency.

Often, birds approaching the cliffs begin to gain altitude when about 5 miles from shore. Birds leaving the cliffs at this distance from shore generally fly lower than those approaching the cliffs, often within a few feet of the water.

Flocks of murres, both approaching and leaving the cliffs, are largest close to the cliffs, although flocking of the departing birds seems to take place farther out to sea than does the breaking up of arriving flocks. Flocks flying away from the cliffs break up as the distance from the colony increases, as though the birds spread out to fill in the areas away from the breeding center. Viewed from the shore, approaching flocks are seen to retain their integrity until single birds or groups of birds break off to occupy their own nesting cliffs. This is most conspicuous at the ends of the colonies, where V-shaped flocks flying along the coastline can be seen to gradually lose their identity while flying along the nesting cliffs.

Four Thick-billed Murres were shot at sea. A male and a female were shot on August 22 at 67°53′N, 166°09′W; both showed evidence of having bred. A male and a female were shot on August 20 at 67°38′N, 165°45′W. The male was molting into the winter plumage but, from the presence of a regressing brood patch and testes still somewhat enlarged, presumably had bred. The female was molting extensively. It possessed no brood patch, and the ovary and follicles were minute; this was probably a nonbreeding bird. Tuck (1961:82–119) presented data which seem to indicate that most murres seen far at sea are young which have not yet reached breeding age.

Both Shuntov (1961:1059–1061) and Jacques (1930:357) observed Thick-billed and Common Murres. Beyond the implication that murres were abundant, only Shuntov (1961: 1059–1061) offered observations of real value in working out the broad outlines of murre

distribution and movement in this area. He stated that both species have similar patterns and that the main wintering waters are located between the edge of the ice and the Alaska Peninsula, primarily in Bristol Bay extending out to Unimak Island, but also extending into the North Pacific. Later (in June), these birds seemed to follow the recession of the ice north toward Bering Strait. He described some of these movements in considerable detail.

Pigeon Guillemot (Cepphus columba)

Two individuals of this species were seen from the "Brown Bear"; one bird just off Cape Lisburne and one at the southern limit of the pack ice, 70°50′N, 165°30′W. An unidentified guillemot was seen near the latter Pigeon Guillemot (Fig. 11). Apparently Shuntov (1961: 1059–1061) did not observe this species. Although Jacques (1930:357) observed it, apparently he saw it only in waters south of the Diomedes. Curiously, Jacques (1930:356–357) observed Black Guillemots (*C. grylle*) in considerable numbers north of Bering Strait even up to Herald Island, while none were observed on the "Brown Bear" cruise.

Kittlitz's Murrelet
(Brachyramphus brevirostris)

Three sightings of this species, totaling four birds, occurred in the open ocean north of Cape Lisburne. Another bird was seen close to shore in this area at about 69°50′N, 164°33′W (Fig. 11). Neither Shuntov (1961: 1058–1069) nor Jacques (1930:353–366) observed this species.

Parakeet Auklet (Cyclorrhynchus psittacula)

This species is doubtfully recorded from Kotzebue Sound. Several individuals were seen and tentatively identified as Parakeet Auklets (Fig. 11). Both Jacques (1930:356) and Shuntov (1961:1061) cited this species, but it is not clear in either case where the sightings were made. Shuntov (1961:1061) implied that this species, in common with Crested Auklets and Least Auklets, was seen near coastlines but seldom in the open sea.

Crested Auklet (Aethia cristatella)

Two sightings of this species, totaling six individuals, were made about 18 miles west of Cape Thompson, but most observations were made farther south. Hundreds were seen in Bering Strait near their breeding sites on the Diomedes. A single Crested Auklet was seen off Port Clarence (Fig. 11). Many auklets were observed on the voyage which could not be identified positively because of poor visibility. This was particularly true in Bering Strait near the Diomedes. Jacques (1930:356) observed this species near the Diomedes but did not definitely identify it farther north.

Least Auklet (A. pusilla)

Least Auklets were observed on August 26 only in and near Bering Strait, where they occurred in considerable numbers. Visibility was poor at the time, with waves up to 10 ft high and winds gusting up to 40 mph from the northwest, and accurate determination of abundance was not possible (Fig. 11). This is the only area in which Jacques (1930:356) observed them.

Horned Puffin (Fratercula corniculata)

This species was found almost everywhere that murres were found (Fig. 11) but in much smaller numbers. Horned Puffins did outnumber murres in the vicinity of Puffin Island in Kotzebue Sound, where the cliffs apparently support large numbers of puffins but few murres. Data on feeding areas are inconclusive, but it appears likely that puffins resemble murres in this respect. The observations from the "Brown Bear" are at variance with those of Shuntov (1961:1061) and Jacques (1930: 355) in that sightings were common far from shore.

Tufted Puffin (Lunda cirrhata)

This species was rarely seen except near Cape Thompson, Cape Lisburne, and the Bering Strait area (Fig. 11). It is not an abundant breeder at Cape Thompson (Swartz, 1966). It is more numerous at Cape Lisburne and reached its greatest abundance in the vicinity of the Diomedes. Curiously, Shuntov (1961: 1059–1061) seems not to have observed this species. Jacques (1930:355) often did observe it in the Bering Sea and near the Diomedes, but did not list it north of the Diomedes.

Yellow Wagtail (Motacilla flava)

This Old World species has become well established as a breeding species in Alaska (Gabrielson and Lincoln, 1959:692) and migrates back and forth from the Asian mainland. Pelagic observations are to be expected in the migration season, but it is somewhat startling to make three such observations in early August (August 7, 10, and 13) and in such a pattern as to imply that the birds make little or no effort to move along shore to the point closest to Siberia before flying out over the sea (Fig. 10).

To my knowledge, no other authors have reported this species from offshore.

Water Pipit (Anthus spinoletta)

The single doubtful pelagic observation of the Water Pipit is difficult to evaluate (Fig. 10). In view of the doubt which exists as to its identity, it is futile to speculate on the significance of the observation.

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